

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A cut off method for a cut off apparatus including:
 - a preceding knife cylinder on whose peripheral surface a preceding helical knife is provided;
 - a following knife cylinder on whose peripheral surface a following helical knife, which cuts off band-like paper in cooperation with the preceding knife, is provided;
 - preceding knife driving motor which rotationally drives the preceding knife cylinder;
 - a following knife driving motor which rotationally drives the following knife cylinder; and
 - a cut off control device which individually controls the preceding knife driving motor and the following knife driving motor,
 - wherein said method comprises: giving, when the band-like paper is cut, the preceding knife and the following knife a specified amount of torque in the direction in which the preceding knife and the following knife are pressed against each other, by means of the preceding knife driving motor and the following knife driving motor.
2. (Original) A cut off method as set forth in claim 1, wherein the value of the torque given by means of the preceding knife driving motor is the same as the value of the torque given by means of the following knife driving motor.

3. (Original) A cut off control device for band-like paper, which device controls a preceding knife driving motor for rotationally driving a preceding knife cylinder on whose peripheral surface a preceding helical knife is provided and also a following knife driving motor for rotationally driving a following knife cylinder on whose peripheral surface a following helical knife is provided, said control device comprising:

a speed pattern generator, to which a paper feeding speed of the band-like paper and the sheet length to be cut off is input, for generating rotational speed patterns of the preceding knife driving motor and the following knife driving motor based on the input paper feeding speed and the input sheet length to be cut off and for outputting a speed instruction value;

a comparator which compares the speed instruction value from said speed pattern generator with a detected speed of the preceding knife driving motor or the following knife driving motor;

an instruction torque computing unit which computes rotational torque instruction values for the preceding knife driving motor and the following knife driving motor based on a signal from said comparator;

a cutting torque computing unit which computes cutting torque of the preceding knife driving motor and the following knife driving motor;

a to-be-given torque pattern generator which distributes the cutting torque sent from said cutting torque computing unit, and generates a to-be-given torque pattern based on the paper feeding speed of the band-like paper and the sheet length to be cut off, and outputs a to-be-given torque instruction value;

an instruction torque subtractor unit which subtracts the to-be-given torque instruction value, output from said to-be-given torque pattern generator, from the rotational torque instruction value computed by said instruction torque computing unit;

a preceding power amplifier which controls the preceding knife driving motor based on a computation result obtained by said instruction torque subtractor;

an instruction torque adder which adds the rotational torque instruction value, computed by said instruction torque computing unit, to the to-be-given torque instruction value computed by said to-be-given torque pattern generator; and

a following power amplifier which controls the following knife driving motor based on a computation result obtained by said instruction torque adder.

4. (Original) A cut off control device as set forth in claim 3, wherein said cutting torque computed by said cutting torque computing unit has a cutting torque value necessary for cutting off the band-like paper, said cutting torque value being based on the basis weight and the paper feeding speed input.
5. (Currently Amended) A cut off control device as set forth in claim 3 ~~or claim 4~~, wherein said cutting torque computed by said cutting torque computing unit is large enough to resist a cut-off reactive force added from the band-like paper to the preceding and following knives, and also to give an appropriate contact force to the preceding and following knives.

6. (Currently Amended) A cut off control device as set forth in ~~any one of claim 3 through claim 5~~, wherein said to-be-given torque pattern generated by said to-be-given torque pattern generator is a pattern having a rectangular shape, a trapezoidal shape, or a polygonal shape.
7. (Currently Amended) A cut off control device as set forth in ~~any one of claim 3 through claim 6~~, wherein said to-be-given torque pattern generator changes the pattern of the to-be-given torque depending on the paper feeding speed.
8. (Currently Amended) A cut off control device as set forth in ~~any one of claim 3 through claim 7~~, wherein said to-be-given torque pattern generator generates an identical to-be-given torque pattern for the preceding knife driving motor and the following knife driving motor.
9. (Currently Amended) A cut off control device as set forth in ~~any one of claim 3 through claim 8~~, said cut off control device being connected to a production management device including an input unit for inputting thereto the basis weight of the band-like paper and the sheet length to be cut off, which production management system (i) outputs the basis weight of the band-like paper to said cutting torque computing unit, and (ii) computes the rotation speeds of the preceding and following knife cylinders based on the basis weight of the band-like paper and the sheet length to be cut off, and (iii) outputs the resultantly obtained rotation speed to said speed pattern generator.

10. (Currently Amended) A cut off apparatus for cutting off band-like paper, comprising:
- a preceding knife cylinder on whose peripheral surface a preceding helical knife is provided;
 - a following knife cylinder on whose peripheral surface a following helical knife, which cuts off band-like paper in cooperation with the preceding knife, is provided;
 - a preceding gear attached at one of the opposite ends of the rotation axis of the preceding knife cylinder;
 - a following gear attached at one of the opposite ends of the rotation axis of the following knife cylinder;
 - a preceding drive gear which has a meshing engagement with said preceding gear;
 - a following drive gear which has a meshing engagement with said following gear;
 - a preceding knife driving motor which rotationally drives said preceding drive gear;
 - a following knife driving motor which rotationally drives said following drive gear, said following knife driving motor having the same rated capacity as that of said preceding knife driving motor; and
 - a cut off control device which individually controls said preceding knife driving motor and said following knife driving motor ~~drive gear~~.
11. (Original) A cut off apparatus as set forth in claim 10, wherein at least either one of said preceding gear and said following gear has one or more teeth shaped so that said preceding gear and said following gear do not come into contact with each other, said one

or more teeth being provided at a portion of said gear relating to a cut off operation performed by said preceding and following knives in cooperation with each other.

12. (Original) A cut off apparatus as set forth in claim 10, wherein a part of at least either one of said preceding gear and said following gear has no teeth so that said preceding gear and said following gear do not come into contact with each other, said part with no teeth being provided at a portion of said gear relating to a cut off operation performed by said preceding and following knives in cooperation with each other.
13. (Original) A cut off apparatus as set forth in claim 10, wherein at least either one of said preceding gear and said following gear has one or more teeth shaped so that said preceding gear and said following gear do not come into contact with each other after passing a specified distance from initiation of a cut off operation, said one or more teeth being provided at a portion of said gear relating to the cut off operation performed by said preceding and following knives in cooperation with each other.
14. (Original) A cut off apparatus as set forth in claim 10, wherein a part of at least either one of said preceding gear and said following gear has no teeth so that said preceding gear and said following gear do not come into contact with each other after passing a specified distance from initiation of a cut off operation, said part without teeth being provided at a portion of said gear relating to the cut off operation performed by said preceding and following knives in cooperation with each other.

15. (Currently Amended) A cut off apparatus as set forth in ~~any one of claim 10 through claim 14~~, wherein the preceding and following knife cylinders are cylindrical members made of carbon fiber reinforced plastic.
16. (Currently Amended) A cut off apparatus as set forth in ~~any one of claim 10 through claim 15~~, comprising the cut off control apparatus as set forth in any one of claim 3 through claim 9.
17. (Original) A cut off apparatus for cutting off band-like paper, comprising:
- a preceding knife cylinder on whose peripheral surface a preceding helical knife is provided;
 - a following knife cylinder on whose peripheral surface a following helical knife, which cuts off band-like paper in cooperation with the preceding knife, is provided;
 - a preceding gear attached at one of the opposite ends of the rotation axis of the preceding knife cylinder;
 - a following gear attached at one of the opposite ends of the rotation axis of the following knife cylinder;
 - a preceding drive gear which has a meshing engagement with said preceding gear;
 - a following drive gear which has a meshing engagement with said following gear;
 - a preceding knife driving motor which rotationally drives said preceding drive gear;
 - a following knife driving motor which rotationally drives said following drive gear; and

a cut off control device which individually controls said preceding knife driving motor and said following knife driving motor,

wherein at least either one of said preceding gear and said following gear has one or more teeth shaped so that said preceding gear and said following gear do not come into contact with each other after passing a specified distance from initiation of a cut off operation, said one or more teeth being provided at a portion of said gear relating to the cut off operation performed by said preceding and following knives in cooperation with each other.

18. (Original) A cut off apparatus for cutting off band-like paper, comprising:

a preceding knife cylinder on whose peripheral surface a preceding helical knife is provided;

a following knife cylinder on whose peripheral surface a following helical knife, which cuts off band-like paper in cooperation with the preceding knife, is provided;

a preceding gear attached at one of the opposite ends of the rotation axis of the preceding knife cylinder;

a following gear attached at one of the opposite ends of the rotation axis of the following knife cylinder;

a preceding drive gear which has a meshing engagement with said preceding gear;

a following drive gear which has a meshing engagement with said following gear;

a preceding knife driving motor which rotationally drives said preceding drive gear;

a following knife driving motor which rotationally drives said following drive gear; and

a cut off control device which individually controls said preceding knife driving motor and said following knife driving motor,

wherein a part of at least either one of said preceding gear and said following gear has no teeth so that said preceding gear and said following gear do not come into contact with each other after passing a specified distance from initiation of a cut off operation, said part without teeth being provided at a portion of said gear relating to the cut off operation performed by said preceding and following knives in cooperation with each other.